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International training program on environment statistics (Program feedback and panel discussion report)

Final report

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Centre for Environmental Studies
Tata Energy Research Institute

Project team

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Acknowledgements

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Introduction

Background

Environmental concerns have increasingly gained in importance as the subject of national and international policies. Sustainable development is being viewed as the best approach towards integrating environmental concerns into the spheres of national and international socio-economic development. This integration needs to be supported by an integrated database consisting of statistical information on a range of topics, which, however, is widely scattered at present. Moreover, the professionals involved in such database generation, compilation, and publication need to get adequate exposure to various environmental concerns.

To meet this objective, an international training programme on environment statistics was organized by the Tata Energy Research Institute during 27 January - 6 February, 1998 in New Delhi.

The training programme aimed to encourage a synthetic and systematic presentation of data from different disciplines and sources. This would assist in the evaluation of existing programmes and policies and also help in formulating an integrated system for sustainable development.

Topics

The training consisted of lectures delivered by national and international faculty and visits to libraries/organizations involved in collection and compilation of relevant databases. The lectures covered the following topics:

- Basic statistics on mineral and forest wealth, flora, fauna, etc.
- Water, soil, and land-use
- Air and water pollution, solid waste and hazardous wastes
- Energy
- Environmental indicators
- Classification and standardization

The training programme enabled the participants to get a better understanding of the concept, definitions, and classifications of statistical variables that describe high-priority environmental issues in most countries and that can be compiled by national

statistical services in an environment statistics programme. The statistical variables identified in this manner are therefore likely to reflect typical data needs of planners, policy-makers and administrators in environmental and related socio-economic fields.

Participants

The programmes were designed to focus on developing countries. Invitations were sent to the state and central organizations dealing with statistics in South Asian countries (Table 1), including Pakistan.

Table 1. List of participants

Country	Participant
Bangladesh	Md Abdul Ahad, Analyst, Department of Environment
	Md A Malik, Deputy Director, Bangladesh of Bureau of Statistics
India	Mr Ahmad Uddin, Asst. Director, Directorate of Economics and Statistics, Bhopal
	Mr B K Biswas, Deputy Director, Bureau of Applied Economic & Statistics, Calcutta
	Dr D Bandyopadhyay, Director, Ministry of Environment & Forests, New Delhi.
	Mr Dhananjay G Sute, Deputy Director, Directorate of Economic and Statistics, Mumbai, India
	Mr Jaydeb De, Deputy Director, Central Statistical Organisation, Calcutta
	Mr M K Nanda, Deputy Director, Orissa
	Mr Pawan Dhamija, Deputy Director, National Accounts Division, CSO, New Delhi
	Mr R A Dwivedi, Deputy Director, National Sample Survey Organisation, New Delhi
	Mr V B Saxena, Research Assistant, Directorate of Planning Statistics & Evaluation, Goa
Indonesia	Mr Setio Nugroho, Central Bureau of Statistics
Malaysia	Mr Michael S Anthony, Statistician, Department of Statistics
	Ms P Chellam, National Accounts Division, Department of Statistics
Nepal	Dr S B Mishra, Deputy Director, Central Bureau of Statistics
	Mr R B Kayastha, Statistical Officer, Central Bureau of Statistics
Philippines	Ms Estrella V Domingo, Director, National Statistical Coordination Board
	Mr Noel O Padilla, Chief, Policy studies Division
	Ms Virginia N Gañac, Statistical Coordination Officer, National Statistical Coordination Board
Sri Lanka	Mr J Dodamgoda, Statistician, Department of Census and Statistics
	Mr Krishanthan Spencer, Environmental Assistant, Central Environment Authority
Vietnam	Mr T T Hung, Statistician, Dept. of Standard and Methodology, General Statistical Office

The programme was attended by thirteen international and nine national participants. Feedback was sought from the participants at the end of the programme.

Feedback

Out of the 22 participants, 19 completed feedback forms were received. The result are given in Tables 2 to 8.

Table 2. Comments on design of the course (per cent)

Course objective		Yes	No	No comment
3.	Are the course objectives well defined?	84	5	11
4a.	Did you receive advance intimation from the institute?	100	0	0
4b.	If yes, did you respond?	80	16	5

Table 3. Structure of the course

Opinion		Very well structured	Well structured	Somewhat structured	Unstructured	Score
5.	Opinion about structure and organisations of the course	3	13	3	0	3.0

Table 4. Usefulness of training

Usefulness		Very useful	Useful	Not at all useful	Score
6.	How useful is this training in your current job	7	12	0	3.37
7.	How useful is this training likely to be for future jobs	6	12	1	3.26

Table 5. Practicality of the programme

Practicality		Highly practical	Practical	Fairly practical	Not at all practical	Score
8.	How practical is the course	3	8	8	0	2.74

Table 6. Interaction and arrangements

Arrangements		Extremely	Considerable	Fairly	Not at all	No comments	Score
9.	How did interaction with peer participants benefit you	6	10	3			3.16
10.	How relevant was the course material	5	9	4			2.89
11.	How satisfied are you with the following						
	a) Reception	12	5	2		1	3.53
	b) Food quality	9	9	1			3.42
	c) Training facilities	12	5	2			3.53
	d) Interaction with faculty	6	9	4	5		3.37

Table 7. Overall success of the programme

Success of the programme	Excellent	Very good	Good	Fair	Score
12. Overall impression on the course	6	9	4	0	3.12

Table 8. Performance of speaker

Speaker	Excellent	Very good	Good	Fair	No comment	Score
Dr Harjit Singh	4	7	7	1		2.74
Dr S P Sharma	5	5	6	3		2.63
Mr Vikram Dayal	4	9	6			2.89
Dr S Biswas	4	8	6	1		2.79
Mr Sunil Chakravarty	3	12	3	1		2.89
Dr Rajiv Mehta	4	8	4	3		2.68
Dr B K Dadlani	2	7	7	2	1	2.50
Dr S N Das	5	8	6			2.95
Mr Harish Chandra	3	8	8			2.74
Mr Abhiram Choudhary	5	6	7	1		2.79
Mr Aromer Revi	8	6	3	2		3.05
Dr A P Gore	11	3	4		1	3.39
Dr V N Sanjeevan	2	6	6	4	1	2.33
Dr C K Varshney	10	5	3		1	3.39
Dr J S Kamyotra	6	8	3		2	3.18
Dr B D Pant	3	4	1		11	3.25
Dr R C Trivedi	4	9	5		1	2.94
Dr M P Mathur	3	6	7	1	2	2.65
Sh N Raghu Babu	6	8	4		1	3.11
Ms Preeti Soni	8	8	1	1	1	3.28
Mr M Karuppasamy	4	8	6		1	2.89
Ms Indrani Nagar	4	7	6	1	1	2.78
Dr Ranjan Bose	8	9	1		1	3.39

The feedback form also sought detailed information on specific views such as the lecture they liked the most, and how to improve the programme. The details of such comments are given below.

Feedback on <u>13. Which part of the course did you find most useful?</u>

☐   Ecological statistics, industrial pollution, water pollution, transport and environment were very interesting and useful including, the panel discussion and the participants' presentations.

☐   The parts which specifically highlighted the environmental issues with statistical methodologies. A few sessions demonstrating the existence of natural resources and their exploration.

☐   The ENVIS system, forest statistics, industrial statistics, ecological statistics, air pollution statistics, water pollution statistics, industrial pollution, green house gas emission statistics, transport and environment.

☐   Ecology statistics, impacts on ecology, energy & environment, the ENVIS System.

☐   The participants' presentation.

☐   The course would have been most useful if new ideas on concepts and frameworks were introduced.

☐   The ENVIS, which explains the various aspects of environment and availability of data on the environment.

☐   Database management/GIS, discussion on development of indicators.

☐   Impacts on ecology.

☐   Almost all parts – database and information technology, ecology, air pollution, impact on ecology, greenhouse gas emission, water pollution.

☐   Ecological statistics, transport and environment, etc.

☐   Almost all components of the course were useful.

☐   The entire course was found useful.

☐   I think most parts of the course were very useful. But unfortunately, such courses generally deal with only some experiences.

☐   For someone with statistics as a background, I found the entire course useful. Considering that it must have taken a lot of time to conceptualize/ negotiate/ prepare/ finalize and implement the training programme, I believe that everything was meant to be useful.

☐   Dr Gore, because he cited specific examples of environmental statistics measurements. The presentation of Dr Varshney, since he presented very clearly how the components of ecology are best measured. Also, the presentation of Ms Soni. Presentation of Mr Das on soil and land, air pollution statistics by J S Kamyotra and water pollution statistics by R C Trivedi and energy and environment by Mr Vikram Dayal because they discussed the various measures available for developing environment statistics/indicators.

Feedback on <u>14. Which parts of the course did you find least useful?</u>

- ❑ In some topics, stress has been given on official statistics and not the environment aspects.
- ❑ Some lectures giving the stereotype position of certain topics without correlating it with the need for statistical analysis of environmental planning.
- ❑ The session on water resource.
- ❑ The topics on statistical concepts and population projects, since in population projects only the method of carrying out the census was explained.
- ❑ The participants' presentation, some of these presentations were not relevant to the course.
- ❑ Population projection – the occurrence of environmental changes due to a high population growth was not adequately dealt with.
- ❑ Coastal and marine statistics – being a participant from a landlocked country.
- ❑ There were no practical sessions.
- ❑ Energy, land utilization, forestry, ecology statistics, pollution, water resources.
- ❑ I do not think/feel that there was any part of the course that was least useful. Even the exchange of ideas/ stories/ conversation during meal times was very useful because we learned a lot.
- ❑ Discussion on population census which focused more on how the population census is conducted rather than on how population statistics is used as an indicator for sustainable development.

Feedback on <u>16. Did the course give you any specific ideas about improvements in your work place? If yes, please specify them below.</u>

- ❑ Yes. The schedule of the Annual Survey of Industry (ASI) may be modified for collection of important environment statistics in consultation with the ministry of environment. Use of internet and client-server architecture may reduce the time lag in the publication of results.
- ❑ Yes. Certain technologies would be explored for environmental management and those areas could be highlighted where the involvement of the statistician in environmental management and vice-versa is beneficial.
- ❑ Yes. We will try to bring up a compendium on environment statistics in our state.
- ❑ The understanding and knowledge on specific issues can be enhanced.
- ❑ Yes, I gained in-depth understanding of the concepts introduced and picked up more topics to be included in the environmental report of Malaysia.

- While I am not directly involved in environment statistics, the course was an eye opener to me in terms of data collection, problems associated with data collection, etc.
- At present, collect whatever statistics related with environment is available in various organizations and to publish a compendium.
- Yes. With a broad idea on various aspects of the environment and data availability, I would be better equipped to handle my work.
- Yes. Systems and procedures of some agencies of the Indian government, system of groundwater classification and database management.
- Yes. On behalf of the state government, we may try to prepare a comprehensive compendium on environment statistics which will be very helpful for administrators, researchers, policy-making authorities, etc.
- The course gives me an idea on important parameters such as the scientific and technical terms and formulae. It also gives me an idea on other countries' experiences on certain issues. Data management techniques and bridging the gaps in order to have a round database.
- A slight improvement has to be done in the compilation of solid waste statistics.
- Helped in the better understanding of the concepts, definitions, and classifications of statistical variables that describe high priority environment issues, therefore can provide the framework for a compendium of Vietnam Environment Statistics in the near future.
- Currently I am working in the field of data collection under a national sample survey organisation through which data on various environmental issues is being collected and published and used by various administrative ministries/departments. The data on some of the indicators may be collected along with the sample surveys of NSSO.
- Do some practical sessions need a longer duration for it.
- The inputs will be useful to me in the future course of development of environmental statistics in my country.
- By defining the framework/coverage of each of the environmental sectors, we are, to a certain extent, now aware of what statistics still need to be collected or improved upon. Alternative methods of monitoring impacts on ecology were also important inputs to our knowledge.
- To a certain extent yes. Because there were a number of methodologies presented which can benefit the participants, but these were not presented in an appreciable manner. Besides, the materials were not always available before the presentations, otherwise there would have been more involvement of the participants.

Feedback on 17. Any other comments/observation about the course.

□   For presentation by participants, advance intimation along with the programme would be helpful. More panel discussions/group discussions. More lectures of experts from university/institutions. More stress on statistical methodology of environment statistics/ indexes, classification, and standardization.

□   A couple of days could have been utilized for the basic environmental. Science topics which could have been beneficial for non-environmentalists. Similarly, at least a day could have been spent on statistical concepts which could perhaps have given some ideas and knowledge to non-statisticians.

□   One officer from the statistics department and another from the environment department should jointly attend such seminars for better coordination from each state in future.

□   In order to build up the capacity with regard to environment statistics, this type of training is very useful. However, to make this kind of training more meaningful, greater focus on methodologies, etc. would be of practical importance. The ongoing efforts in building up the capacity should be vigorously pursued by conducting intensive training of this nature and thus making the personnel better equipped.

□   Congratulations TERI! you have done a splendid job in organizing this course.

□   It might be a good idea to have better time utilization, particularly in the morning. Based on my experience, the work is to start at about 9.00 a.m. Stretching the daily programme upto 5 p.m. may not be appropriate in terms of absorption capacity and concentration.

□   It would have been better if some aspects of natural resource accounting had been covered in the course.

□   It would have been better if speakers observed time limits, otherwise more time should have been allotted for them. In this regard, the starting time could have been adjusted. The tours, as part of orientation, are a must, especially since a considerable number of participants are foreigners. But in the present context of tourism, the country's products/ goods/services are equally important, if not more, than monuments. More time should have been spared for the participants to sample the products during these tours. It would have been better had the related topics been discussed sequentially (e.g. water resource followed by water pollution, etc.), that way more discussions would have been possible within the time schedule. It would have been better if the panel discussion was used to discuss relevant issue on the FDES (eg. its usefulness, the disaggregation, the variable parameters) and not merely as a forum to know the panelist's expertise and current concern/advantages.

In this regard, Dr Varshney and Dr Pant should be congratulated for achieving the purpose mentioned above. R K Prasad as well as H Chandra should be congratulated for their commitment and efforts. They deserve our thanks.

It would have been better had a workshop been held to chart future directions (albeit on a recommendatory capacity) beyond compiling the data (where they would be presented in a more useful manner) considering the interface between the experience of statisticians and environmentalists.

The programme is supposed to train the participants in terms of basic knowledge both in theory and practice. Therefore, the insights gained may be applied directly to improve environmental statistics. However, considering that this is a new topic/subject, it is ok. What I can suggest, it should be provided again for the sake of environmental purposes.

I would like to congratulate TERI and CSO for the successful conduct of the programme. From experience, I can say that it is very difficult to attend to so many participants, especially foreigners. The session could have started earlier to give more time for the lecturers. Different approaches were used by the lectures. I think that it was obvious that some lecturers were more effective than the others and those that I liked shared some common approaches namely that of i) explaining the coverage of the sector first ii) discussing statistics/indicators important for monitoring the condition of the sector (not necessarily specific to India), iii) discussing the methodology for collecting/measuring these statistics/indicators, iv) current issues/concerns may I therefore, suggest that an outline for the format of lectures be formalized next time or if possible a meeting of all lecturers should be held first so that a standard format or coverage of the lectures could be achieved. There was a tendency on the part of a few Indian participants to raise concern specific to their areas. I think a few participants were rude to the lecturers. While I agreed with their sentiments, the lecturers need to be respected. After all, preparing and delivering a lecture is not easy.

a)   I am extremely happy I attended this training programme. The knowledge gained from this experience and my stay here has totally changed my idea of India. I can take some good and pleasant memories of the warm reception and excellent facilities extended to us.

b)   Thanks a lot for all the hospitality extended to us especially by Mr R K Prasad and Mr H Chandra who never left us during the programmes, and the rest of their staff who have quietly worked in the background. Mr Amit Kapur has also been very good to us. I do look forward to another stay here in India.

❑   In general the speakers were all experts in their respective areas. Besides the levels of knowledge of the participants should have been considered because if that was the case the course would have been thought down to the level of knowledge of the participants. Some time should be allowed for the participants to do when they want to do like shopping or visiting - at least half day. I think the training was so tightly structured that no such time was possible.

Panel discussion

Panel discussion

A two-hour long panel discussion was held to discuss the additional requirements of environment statistics and appraise the present programme. The following experts chaired the discussion.

Dr S C Maudgal (Chairman)
Advisor
Ministry of Environment & Forests
Government of India
New Delhi 110003, India

Dr S D Makhijani (Panelist)
Additional Director
Central Pollution Control Board
Delhi 110032, India

Sh R L Narasimhan (Panelist)
Director
Department of Statistics
Central Statistical Organisation
New Delhi 110001, India

Dr B D Pant (Panelist)
Senior Statistician
Asian Development Bank
Manila, Philippines

Dr C K Varshney (Panelist)
Professor, School of Environmental Sciences
Jawaharlal Nehru University
New Delhi 110067, India

Dr S S Srivastava (Panelist)
Director General (Retd)
Central Statistical Organisation
New Delhi 11001, India

Dr S B Mishra (Participant)
Deputy Director
Central Bureau of Statistics
Kathmandu, Nepal

Dr S C Maudgal

There has already been considerable amount of presentation and interaction on data generation, data management, data retrieval, etc. related to the area of management.

There are two issues: 1) how easily the data can be accessed, and 2) how good or reliable the data is. If you are able to satisfy these two criteria then we would be in a position to make use of the data and also proceed further in terms of trying to fulfil the objectives of databases. Many of you are very intensely working on the data collection, data generation, data management issues, and there would be lot of suggestions. Many have already been discussed during the previous sessions but **what needs to be emphasized again and again is that data which is utilized for environmental management purposes need not necessarily be reliable environmental data.**

Considerable amount of data on science and technology, population and agriculture in different sectoral development is available. The data has to be often tailored for use in the strategy to be worked out for sustainable development. And since the need for this data is at the local, national and at the international level, therefore there is a necessity for some sort of standardization so that what is being collected at the local level is as valuable to a person who is trying to access at the international level and vice versa.

I happened to be a data user and presently I am trying to create databases for the clear technologies. Fortunately we have expert panelists over here who will be quite happy to share their experiences.

Dr S D Makhijani

The Central Pollution Control Board has a monitoring network for water pollution at 480 stations in which we are monitoring 24 parameters every month, and this monitoring is being carried out with the help of state pollution control boards (in about 60 laboratories).

Dr Maudgal has already pointed out that we need to have a quality assurance programme with every type of data we are generating. For this, we have a regular annual

analytical quality programme for all the laboratories who are participating in this programme. We send samples twice and then we also inform them of their results. At present, we are monitoring merely physico-chemical parameters and just two meteorological parameters.

I feel that we are lacking in some important parameters like heavy metals which we are not measuring. This is one of the important segments of the environment and we are aware that the levels of heavy metals are increasing. **Another parameter is pesticides.** Although we do not have pesticide measurement in this monitoring programme, we have carried out studies and have found that the pesticide levels are also increasing in river and ground waters.

The reason for not including the two segments in this analysis is mainly because most of the laboratories do not have facilities for measurement and if some of them have the facilities, they do not have the adequate expertise to do the analysis in a reliable way. We have already made an initiative to get these instruments in all the laboratories through various programmes such as the ongoing World Bank programme, in the first phase, of which 34 laboratories are being upgraded.

After that we would be able to incorporate the heavy metals and pesticides in this programme also. And every year we come up with a status of water quality in the country, yearwise, and we have been publishing it (the 1996 Issue has already been published) and it is available to any data user. Similarly we have an air quality network of 290 stations, spread over 93 cities in the country. In Delhi also we have 9 locations, and in addition we also have some continuous automatic monitoring stations. **But important parameters such as polyaromatic hydrocarbons, and ozone are not being measured.** At present we are measuring only sulphur dioxide, and suspended particulate matter, **not the respirable part which is the most harmful.** Some countries are going in for $PM_{2.5}$ which, along with PM_{10} are the most harmful parts of the particulate matter. At present, we do not have facilities for measuring this but we have initiated it from the current year. We have placed an order for about 100 respirable dust samplers and very soon we will be starting PM_{10} monitoring at 100 locations out of the 290 locations. **Lead is another parameter from vehicular pollution but is not being monitored anywhere except in Delhi. The levels of ozone are increasing day by day. At present we do not have the facility of ozone monitoring except in Delhi.**

We need to have data on these parameters – otherwise incomplete data on sulphur dioxide, oxide of nitrogen, etc. will not be helpful as important as this lad polyaromatic hydrocarbons and $PM_{2.5}$, PM_{10} and ozone etc. Moreover, we have found that sulphur dioxide and oxides of nitrogen are generally within the permissible levels. The other important parameter is carbon monoxide; at present we have monitoring facilities in very

few cites such as Delhi but not at 290 locations since we require very sophisticated instruments for measurements for carbon monoxide. Every year we come up with the air quality status of 290 stations which is also made available to anybody who might want it.

Similarly, we have a coastal monitoring network of 167 stations and also some groundwater studies which we have carried out. For Delhi we have done **a special project for 250 locations for 42 parameters including 6 pesticides and 10 heavy metals and all physicochemical parameters.** Then we also have a problem area survey for groundwater. All this information is available with us for public use.

Sh R L Narasimhan

As you all know CSO is active in the field of data generation and wherever possible we give some interpretation so that the right meaning is understood by all the data users. Here in this training workshop we have had both environmentalists and statisticians.

Environment is a macro subject and it has many connotations. So when you break it into components, we should be in a position to identify the various parameters and those components which need to be first understood by all of us who are present here. So that consequently calls for the clarity in concepts and definitions and many of us, except those who have been professionally involved or those who are experts, have a very hazy idea about what pollution is. Precise concepts and definitions have to be driven into the ears and minds of all those who have attended this programme. **The availability of data is a question. Then comes various gaps. What sort of effective steps we have to consider so that we, are able to narrow the bridge and cover up the bridge slowly in a phased manner.** That is why the question of mechanism, and data collection comes in. **Regarding the additional data collection, the issues of importance is that what data you have to collect and of what quality and at what frequency you are going to collect and at what levels. Is it at a country level, state level or district level, river basin or forest level?** So on what levels you are going to collect these information would have to be decided upon. **Having done that, experts should sit together and find out the meaningful interpretation of the data, and if you get a time data, or cross sectional data how do you interpret those data in order to arrive at meaningful messages. After that what comes is dissemination of the information among all those involved in policy or implementation or at the grass roots level.** But as you go down the ladder many of us who are involved at the grassroots level may not have a clear perception or may not have the required sensitization about all these components. They should know what they are doing in the matter of collection of the data and what it brings to them, only then you will be able to ensure the quality part of it. Otherwise, as in most of the programmes the village or any other level the matter of aggregating in the macro level and

finally it becomes totally distorted unless people who are really involved in the collection are aware about the consequences of such distortions or quality not being given due consideration. All our friends who are assembled over here are able should keep in mind that you are able to really produce that type of data which will give true picture at the same time do not distort the situation.

Dr B D Pant

I would like to distinguish the data into two categories. One is core environmental statistics, meaning data related to air, water pollution, etc which are measured scientifically. The other is related to environmental statistics such as health data, etc. The present project aims to bring out all these statistics together in the form of an environmental compendium by developing member countries through their respective national statistical offices.

What is more important is not generating a new set of indicators, but whatever indicators have come out after a series of discussions need to be suitably given consideration for data generation to suit the local requirements of a country.

Dr C K Varshney

Specialists have talked about important aspects of statistics. But what is to be asked is that whatever data we have, is it sufficient? **Presently data are being generated but they are scattered and it is at a very local level.** Now, this fact must be remembered. Secondly, environment is in a very transitory stage.

I think the data has to be made available in a form which is palatable to most of the people at the village level and community level – so how can we simplify this information. Technical information has a solid base which is scientifically proven, but at the same time it should be presented in a manner that an average person can understand. Politicians may not understand since they are not scientists. Decision-making is going to be a process in which they have to play a very important role, so all actors in the society have to be taken into account while we process this data and ultimately we have to provide a profile in a shape which is palatable, usable and so on. It is not a question of having very nice documents is lying on the table. Now who are the users, what is the constituency of the data we have to be very careful about such matters. There are four types of user: i) researchers, ii) the decision makers at the national level and decision makers at the local level, and iii) the international financial institutions and other international bodies. I should also include actors who are responsibly deciding the world politics. For example, the carbon dioxide data is not only required by the decision makers, by those who plan for the future energy resources or energy strategy, but are also

required in order to decide the international geo-politics. So I think all these data are needed. This data is also needed by the lenders because now a new clause is going to come which is already in operation – lenders liability. If you provide finances which ultimately leads to environmental degradation then you are held responsible along with the ones who are misusing this. So **I think the lenders liability clause is already operative in some places and is going to come about in others.** Again, the West which is responsible for most of the environmental ills has really made a turnabout, they say that whatever you produced consumer electronics the person who produces must take it back. Now these are the clauses which are already in place. And I think the same kind of thing is going to come about here, so these kind of statistics are going to be used at various places. **The question is that when you are producing an electronic good or when you are producing electronic gadgets what different types of plastics are you using and can you reduce and simplify? so that reproducing and recycling become simple.** Now these are the kind of things which are going to be attracting your attention in the years to come. There are two or three things which I would like to mention. So far the statistics that I have been able to lay my hands has an extremely weak database in terms of emission. I think my friend Dr Makhijani has already mentioned that they are focussing their attention on these aspects and very soon perhaps they will have it in place. VOCs, NMVOCs that is non-methane volatile hydrocarbon and so on. But **I think the question is not how much is in the atmosphere. It is also important to know what and where and how it is being emitted. I think emission inventory in the region are extremely weak and I think is the one thing which has to be added to the personality of the data that we have emission inventories how much carbon dioxide have been emitted** some effort has been made through the ADB, but I think in most of the other pollutants, both of air as well as effluent as well as of metals, the emission inventories are very weak. This is my first suggestion. I think Dr Makhijani also pointed out which others have also made it not so clear but I think some passing reference **most of these statistics environment consists of two things biotic and abiotic environment.** Most of the statistics focussed only on the abiotic factor. **I think the time has come for the information to be collected not only for the purpose of being comprehensive, but also it is because it should serve a purpose about the biotic factors.** Now what are the biotic factors? There is no going back from developing the necessary biological indicators and carefully examining them, looking at their availability profile and behavioural response.

Now the other point that I want to make is that the **integration of data is very important.** The people want some kind of number or some of kind of scale against which environmentalists could be evaluated. An average person is not interested in, for example how many ppm of this or how many ppm of that in which you and I are interested, he

wants analysed information which he can relate to very quickly. It has to serve a purpose in the hands of the average person, corporator or municipal counsellor. I think we have to think for his needs and his needs essentially relate to **bridge between the scientific content and the kind of understanding that he has** and for that purpose we have to simplify this data. We first need to develop an elaborate scientific framework and then we try to simplify and present the facts in a very simple and understandable manner. I give you one example which has impressed me to a great extent. And this is about the global greenhouse effect you know the global greenhouse effect – is on account of a family of many trace gases which are collectively termed as greenhouse gases.

I need not elaborate but it will suffice to say that carbon dioxide has been considered as a unity and against this others have been measure for example methane has 20 whole to whole basis so what will they do that they all add up and then arrive at one figure and then say they and then say that the greenhouse potential is 25, 230, 480 and so on which means that summation on the basis of their relative contribution and then you come up with one number and therefore and the countries can be classified according to this kind of information.

Now this is one such a model but certainly it can give you considerable amount of encouragement to develop some kind of a synthesis but I say information or guideline out of the complex and the interesting scientific data that you going to really provide for decision makers to help sustainable development. Sustainable development can only be achieved if at various level decisions are in conformity or for protecting the environment and with full understanding of the environmental issues and for that purpose I think one is talking and thinking about environmental statistics in India and I think this purpose can be served by all the details of the data as much complexity and as elaborate as possible and at the same time you should be able to simplify it.

The last point that I want to make it that environmental statistics is going evolve it is in the stages and there much remains to be done updating and therefore **ongoing needs for continuous need updating our knowledge requirement** and for that there is a need by the region and I think you I will draw the attention Dr Pant who is here to really provide the necessary but I say **capacity building in this field** and this requires periodic updating and so on and also there is a need to really have a regional data base because I want to end up by saying that the data give you a signals of different kind some set of data of are important only for global purposes and they have no relevance at the local level and some set of data are available and are usable only at the local level but they do not shed any light at the global level therefore there is a whole staggering of data must have objective for global level, for regional level, for national level and for local level. For example, carbon dioxide content in the atmosphere is for global level and it has nothing to

do with local level it does not give you any clue in terms of anything because you cannot have any activity which is going to effect this global level average carbon dioxide content.

Pesticides is another issue which very important issue which needs to be taken into account because our agriculture has become very heavy input agriculture and some times cross fail they are likely to fail in future also because they depend on the very complex game of climate and climate can back fire and people if they have made heavy investment they are under tremendous debt and it is unfortunate that in our country a large number of people have to suicide because of this I should say illogical propagation, use, practice of using of too excessive inputs in agriculture so I think these are very important issues you are thinking it in other way that is right it is a very major issue and this is going to repeat in many place. **I think these are very serious issues and tremendous amount of constraints at social level can be prevented provided these things are taking into account and provided. We also include the biological statistics in a small manner and make a beginning now.**

Dr S S Srivastava

I have been involved in what may be called statistical administration or management of data collection. I suppose some of the experts will be happy to note that what may be called that institutional strengthening for building of environmental data basis by development countries particularly. Now for making the remarks, I happened to be The Director General of statistical organization and I used to hear that world community is very concerned about environmental issues I did not know exactly what they were because as a common man you get disturbed with bad smell of air, quality of water you get and I think that there are sad impacts deforestation and beyond that you cannot. You are unable to think mental imagination does not beyond that. You are specialist. But because this talk I only sees opportunity of saying that let us go ahead and do the project and that is why we are here today.

Now I wish that the actors in the game in various countries who have been implementing the projects almost for the past two years. Some of them are ahead in the game, some of them are behind and some of them some perhaps more behind from these kind of experiences like international training workshop. That have got to learn as to how and where to do it. Now I think that has been my concerned generally speaking.

There is a little gap let me clarify that in this institutional strengthening what has been envisaged as a framework is that **country would set up of a mechanism of setting a dialogue between the environmental scientists** by way of what they called we in India have a steering committee and other countries have got steering committees and then this committee will proceed to talk about a framework for the development of environment

using that framework they will produce a compendium I am sure that all of you have seen that compendium that India has recently brought out that is a third framework and then there will be a training so that this concepts can get cleared and that is the part which we are playing.

Now this model has been sort of specified we are this model has been implemented. They were the leader they have been implemented by Nepal and they have produced a very beautiful compendium we were lagging behind little bit but we have not brought up of our compendium what are the short fall there and how do we now proceed further is I think is the issue that issue I am concerned with and short fall that I noticed was this that very terminology that is being used by environmental scientists is Latin and Greek. I can just do not understand and we saw breaking this kind of barrier and have a more meaningful dialogue because until you see not that I am taking these things lightly but can massage the data on the air pollution in Delhi in order to demonstrate that the pollution in Delhi is not there as compared to Kathmandu say for example.

I am giving you an example because it depends how do you interpret it. The data to estimate various parameters and I can take my observations at the particular time when the pollution is in Delhi I know it is very low and I would have that example of observation and will have some averages in standard deviation etc and counterpart observations in Darjeeling but which is I know much have got cleaner air but my statistical inference can never demonstrate the reason what I am trying say that while I think one of the speakers here pointed out that how easily can one access the data are issue how reliable data are these data are issue **but what are these data is I think is also an issue** in my mind.

Now on the one hand there is a lot of lists that has been created by international agencies and we always taught somewhere so we brought out a compendium what are these data and how are these to be generated. These are statisticians framework. Generators are environmental scientists just to clarify what was going on as I came into the room when Dr Saksena from Goa was giving his lecture. There is doubt in my mind that carbon dioxide carbon monoxide content air or SPM will have to be measured by the scientific community and the environmental scientists. But the **statisticians have to talk about the representative of the observations and they can do that only they can understand how all these observations are taken. So this dialogue to my mind is the issue and this is what we need to do.** Now how do we go about doing in this?

And after that I just make suggestions a collaborative project between CSO and Central Pollution Control Board. I do think this project has not yet seen result although it going on for about 2/3 years. That is why I said if I am wrong Mr Harish Chandra you may correct me, because /the data which was put forward by the CPCB was not

comprehensive which I and you are unable to analyze because the object talks about the pollution. The compendium has been now broken down is that we would be able to understand or the marriage what is being called marriage between environment scientists and statisticians on one small item so that next time that portion of compendium which is containing air pollution information becomes that intermittable. I mean this is my belief will suggest that should proceed and there should be many more such projects that should be set up either the CPCB or ADB project or by CSO itself. I do not think CSO has got now facilities as I understand in order to commission this project alongwith environmental scientists they are not highly expensive in terms of analysis of data. You see the way the statisticians would look at any matter is this what are the issues? That we are talking about. Now first of all you raise the amount then you go and say for monitoring or **developing policy incentives of issues** what are the data needs that is item number two. What are the data requirements and what are the data gaps and **then if there are gaps how do we go about filling those gaps.**

So that methodology is much sustained but in these matters well we have got so much data there are agencies in environmental sciences which have got hundred years of experience in which I mean I am thinking in terms of botanical survey of India, zoological survey of India. They have done international they have got international standing and they can be good friends philosophers in this science.

But let us understand what are those data gaps and in order to set up the dialogue we must have the small and small projects so with these comments I would suggest concrete things that in one of the discussions that I was present the question that was being asked was how frequently published the compendium and what should be published in compendium and people were saying one in three years once in five years etc. May I suggest that as far as India is concerned and department of statisticians is concerned they should bring out their **compendium as soon as 6 to 8 months.** Because if the frequency and the regularity of the data is secondary learning process is the first concern while lot of knowledge has been given having done good job compendium but let me frankly say **I am not ashamed to admit that there is a lot of gaps in to that in all kinds and most of these gaps can be filled up and compendium updated in a rather quick time say about 8 or 9.**

It is not yet a model which would should be repeated you know every so this is my recommendations and rest two of the compendium again quickly but and make it a model would be now repeated with a regular frequency I would comment whether it should be once in two years, once in three years once in annual so and so.

Now other thing I would like to point out here that in India CSO does not generate data in all states, in all sectors for all sectors and knowledge is very vast this is only a

example. We provide what is called leadership in scientific basis of statistics data generation normally the union ministries generate the data one debate which was there in India for quite sometime whether this project should be in the Ministry of Environment and Forests. International community was of view that this should be centered in the national offices and of course likely so in one way CSO has got a role of orders and standardization and therefore the project was centered ultimately this question still remain once the model is set up and systems gets going well but I am just put it forward to say that question exist The reason I said that already there is a state of environmental report coming out there are such reports which are coming out from international forum also. But in India we have beautiful reports which is coming out state of environment.

We have a compendium let us have a good marriage that means that you should not be oblivious of and neighbors that my friend that my and important actors in the way and do not work statisticians otherwise uncared, unsung people if they decide that. Let them not do that Let them get away from that danger. **Then coming to the training workshop again I must say that training workshop should be made regular feature. This is my recommendation.** Please take it. This is not an expensive affair but it just exist you know together the group like one that we are here is not a very expensive exercise. It requires only a little will power and little planning. Let us have a regularity of this. Because you already have a framework and this is your objective that you are going to improve that framework.

You know that this answers the questions that has been raised by remaining panelists on what may be called the environmental scientific data and its related data and we have been doing for the time being and in the related sector habitat. Habitat defined by the non-environmentalists you know there are species, there are habitats of various kinds, but we are talking about population. So there is a section of population.

My last suggestion about the shape of the compendium. I was very excited with lecture which delivered just now at about 2'O clock by Dr V B Saxena from Goa, whether people present here agree with whatever he was saying right or not but I thought that he was talking something very brilliant. He was talking about model building. He was talking about relationship of inter-relationship between variables. Now, without saying where are you heading may I suggest for the calculation of environment planners I mean planners of the project. In India also in other countries many participants other countries from Philippines from Bangladesh and Japan that this is the consideration and I have seen such reports that in the compendium our concerned is although our data base we have done some job in that under six headings which we can add two more sections one may be called small analytical papers that are coming up because this would enable the steering group and the steering workshop to take up that paper for further discussion to see what

linkages with data collection requires.

I am having a paper of the kind Mr Saxena was presenting in the morning to be included and one we studied all the time I do not know whether many people I have showed you the small film that we have produced. If you see that film and your heart blaze that and you feel that the next generation are going to curse you because you are going to leave the environment in such a bad shape that the children will say we had very bad fathers and grandfathers and let me quickly add that there is something called world futuristic society. I have not seen their output but I am being seen the abstracts or itself of papers of Times of India of newspaper which is our Indian newspaper and it makes the exactly opposite point of environment. Day before yesterday they were carrying a big article which says that in the economic point of view environment is not an issue, environment should not be an area of where investment should be made today. Because they say economic development is a greater issue and argument that he is giving is this one dollar that you invest in the real terms is going to become fifty dollars of the after some number of years when the per capita incomes and availability of people is better. If that would be the time where the larger proportion of funds can be debited into environmental in arresting the degradation of environment which it is considered might have become much worse by that time.

This is, I am only telling you that you see there views, there is exactly opposite are done. It does not matter we have assigned data produced we have to produce data which were this is. So my submission on this as final summary and we will go ahead with the steering committee, **we will go ahead with updation of the compendium.** Let the compendium have it is for consideration that two additional one as analytical output and one on as I did not spell out **it is called newspaper clippings around the world.** It is called newspaper clippings. It tells you a lot of things as to what people are thinking about. You know presently on the newsletter CSO people and other people would be familiar with that they have lot of sections where they will have just a photocopy put that there I like the headings if you are interested you can see.

My last recommendation and then I have said please undertake projects. Last suggestion is this that please do what is called **internet working of data** this is the suggestion was both environmental science ministry and department of statisticians while a please dispassionately there is a lack of data but this is also true that there **large amount of available and floating around which are not honest.** In fact a research of this kind can tell you some of them are may be useless. While it can tell some of them can be added.

Dr S C Maudgal

The learned analysts have shared their rich experience and they have pointed out some of the lacunae that exist today in the environmental data. They have stressed on the adoption of a correct methodology and the need for creating new database.

The message coming out is loud and clear – that there is a need for data information on the type of data that express the objectives, and **the extent to which data collection is to be done depends on the ultimate end-use of the particular data**. The data being collected, say on equality, can be used for policy formation, policy reformulation, and it can also be made use of for project formulation. It can be tailored to start programmes on many other related areas. Therefore we **need a multi-disciplinary guiding team** which brings into focus various issues which have to be taken into account. To ensure that the data once the requirement not only for various uses but as far the various level as Dr Varshney said that the geographical distribution local level, regional level, national level.

Having said that I know that it is not the easy task and as Dr Srivastava said that the data can be general to make a presentation in the very beginning the objective of presenting data is but to ensure that the data is created able to serve and unless we were in the business of data formation and making data fully rely that what purpose you put we will in terms of making a lot of data which may or may not be the case. There is an abundance of data available on the internet. The problem arises when one is unable to decide on the type of data one specifically requires. So, it is important to be able to sort out the relevant information from the irrelevant. This is not my intention to go on raising the issue if we have a couple of observations from our participants on floor and in response to what the panelists have expressed their views on in terms of some independent expressions.

Dr S B Mishra

In my opinion we can have main concern of the sustainability of the development of the environmental and implement and development of environmental statistics. Now we are here upto we know that India is highly advanced statistical so that type of level of you cannot compare so concrete of the reason so we have our own type of unique with regard to the development of environmental statistics development and improvement.

So as a matter of fact we identified some of the major environmental issues that our country faced in a two decades mainly mid seventies. Topsoil loss and some urban pollution particularly Kathmandu in Nepal. **So actually environment managements those who are responsible in task of the environment information back ups for implementing their medicating results or some planning and in the meantime we got**

an opportunity to be associated to be involved in the data project and this project has given us a very good insight in this field particularly in reference to my country. Since the Central statistical, National Statistical that is our Central Bureau Statistics National Statistical agency were identified nodal agency or lead agency to develop and improve this environmental statistics in Nepal. In the beginning we were confused what to do. So definitely we had to access with depend environment scientists and we had to develop some of our requirement and this way we could identify some of the basic minimum data requirements, indicators and from visibility of data requirement statistics and that way we just develop our framework from of environmental statistics which is in the level say country level, district level, administrative level and unit of measurements, and then which agency may take care of that environmental statistical field indicators and collection and some sort of collection methods early one in socio-economic area and also may be able we are hopeful to introduce some of the hopeful to utilize the socio economic surveys and associates to environment related statistics say for example in the morning some of our friends also highlighted. The data available in the official statistics they are not to make use of environmental areas we know that import of say refrigerators airconditions might give some sort of indirect variable or indicator to measure some sort of ozone depletion something like. But those data are not available. The data classified into group classification like electronic goods similarly so then we just try to come out to compromising points. There is very big in our data requirements or some other we can not be so much precise as air Indian so this is why we just try to compromise with some basic minimum data requirements or some say for the or some other measurements or say for example in the case of mitigating measures of the transport pollution we have not been able to do this type pollution measurements due to vehicles.

Some efforts have been done but not in such a regular firm. So this is why we introduced these days banks are floating loans to the private companies to import new vehicles. If we have new number of vehicles, you have this type of data I think it gives some indication of some improvements. So this way, if not data available atleast we want to know atleast numbers, somewhere at least what are numbers as for example we are very much concerned with the use of pesticides heavily used by the farmers and it has become visible but we have no data. Atleast we wanted to know the number of pesticides dealers that figure also indicate some sort of first time information so this way if not data, if not list then we wanted to know we have already lost our problems. So atleast we wanted to know the numbers if not other details. So if not these list something like that so textual presentation. Textual presentation also in the beginning gives some indication whatever we have pursue in our mind whatever we have good loving person can give

some textual presentation say for example in pesticide misuse we know the different areas in the newspaper everywhere there is a news of havoc of this pesticides use. But that has not been done by the information. So this way we have developed our compendium taking into consideration the basic of data requirement for planning policy making and environment management and side by side our requirements upto the data availability.

Then the compendium just give us some idea of what data is available and what is not available then we just develop our compendium on whatever data we have that we have introduced and we try to develop our compendium first we keep some highlights on environmental sciences what is flora, what is fauna and a situation and some glossary part at the end of the book then we just try not only this incorporate the information but also the analytical text in the same chapter, if possible that way we have just tried.